Math 3 Review Unit Review Name: _____

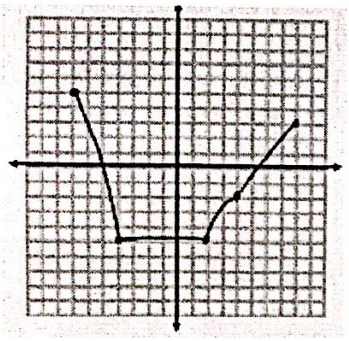
Name the parent function and write the transformations for each of the following.

1. $f(x) = -\frac{1}{x-2} + 11$ rational — x axis ref, r2, ↑11

2. $y = \frac{1}{2}(3x)^3$ Cubic — Vertical Comp by ½, Horiz Comp by ⅓

3. $f(x) = 2 \cdot 5^{-(x-4)} + 1$ exponential — Vertical Stretch, y axis ref, right 4 ↑1

Sketch the transformations from the parent function given below.



(-7,5) (-4,-5) (2,-5) (4,-2) (8,3)

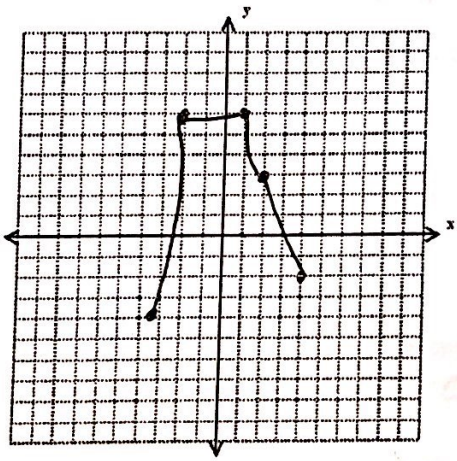
④ x-axis -1·y, hor ½x

(-3.5,-5) (-2,5) (1,5) (2,2) (4,-3)

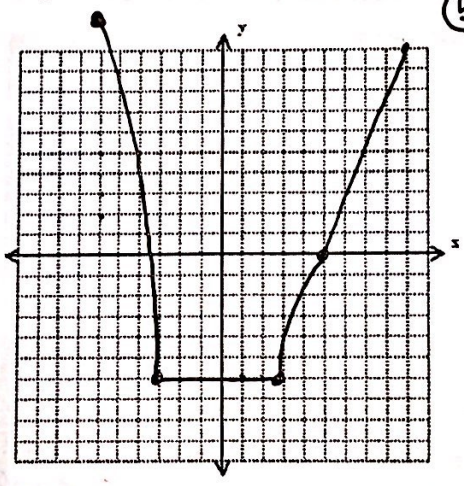
④ y+1

(-3.5,-4) (-2,6) (1,6) (2,3) (4,-2)

4. $-f(2x) + 1$



5. $2f[(x-1)] + 4$



⑤ 2·y, x+1, y+4

(-6,14) (-3,-6) (3,-6) (5,0) (9,10)

6. **Write the equation of a line that goes through the point (6, 7) and is parallel to $2x + 3y = -11$ in standard form, slope-intercept form, and point-slope form.**

$m = -\frac{2}{3}$ // $m = -\frac{2}{3}$

$y - 7 = -\frac{2}{3}(x - 6)$

$y = -\frac{2}{3}x + 11$

$\frac{2}{3}x + y = 11$

$2x + 3y = 33$

7. **Find the equation of the line that goes through the points (3, −8) and (−9, 5).** Slope Int form

$m = \frac{5+8}{-9-3} = \frac{13}{-12}$

$y + 8 = \frac{13}{-12}(x - 3)$

$y + 8 = -\frac{13}{12}x + \frac{39}{12}$

$y = -\frac{13}{12}x - \frac{19}{4}$

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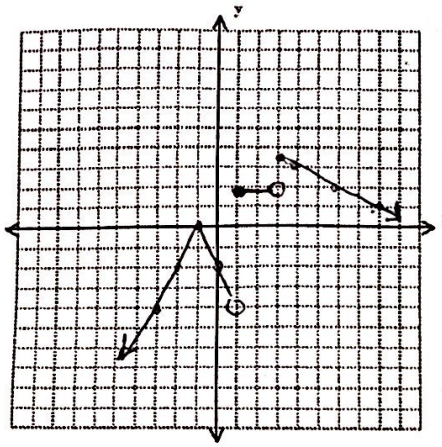
8. **Graph the piecewise function and then complete each of the following.**

$$f(x)=\begin{cases}-2|x+1| & x<1\\ 2 & 1\le x<3\\ 5-\frac{1}{2}x & x\ge 3\end{cases}$$



Domain: $(-\infty,\infty)$

Range: $(-\infty, 3.5]$ $y=5-\frac{1}{2}(3)$

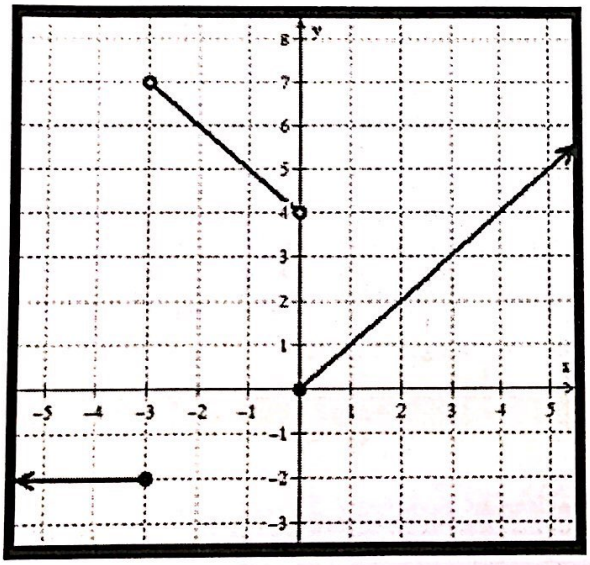
$5-3/2=3.5$

$f(-3)=-4$

$f(3)=3.5$

$f(1)=2$

9. **Write the piecewise function for the following graph.**



$$f(x)=\begin{cases}-2 & (-\infty,-3]\\ -x+4 & (-3,0)\\ x & [0,\infty)\end{cases}$$

Write the piecewise function to model each of the following situations.

10. An SUV was purchased for \$35,750. The value of the vehicle decreases by \$2400 a year for the first 4 years and \$1700 per year for the next 6 years.

$$f(x)=\begin{cases}35{,}750-2400(x) & [0,4]\\ 35750-2400(4) & \\ 26{,}150-1700(x-4) & (4,10]\end{cases}$$

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11. You have a summer job that pays double time for overtime. That means if you work more than 40 hours in a week, you get paid twice your hourly wage of $8.25.

x = # hours

$$f(x) = \begin{cases} 8.25x & x \le 40 \\ 16.50(x-40)+330 & x > 40 \end{cases}$$

12. The zoo charges $15 per person for groups of fewer than 50 people. Groups of 50 or more are charged a reduced rate of $10 per person.

x = # people

$$f(x) = \begin{cases} 15x & [0, 50] \\ 10x & (50, \infty) \end{cases}$$

For each of the following find all of the intercepts, the domain and range, the local and absolute extrema, and the increasing, decreasing, and constant intervals.

Calculator

13. $f(x) = x^4 - 4x^2 + 2x + 2$ on the interval $(-\infty, \infty)$

a.) Inter $(-2.12, 0)(-.511, 0) : x$
$(0, 2) : y$

b.) D: $(-\infty, \infty)$ R: $[-4.944, \infty)$

c.) ab min $(-1.52, -4.94)$
ab max none
loc Min $(-1.52, -4.94)$
loc Max $(.259, 2.234)$

d.) Inc $(-1.526, .259) \cup (1.267, \infty)$
dec $(-\infty, -1.526) \cup (.259, 1.267)$

Calculator

14. $f(x) = x^4 - 4x^2 + 2x + 2$ on the interval $(-2, 1)$ ←—***

a) $(0, 2)$ $(-.511, 0)$

b.) $(-2, 1)$: D
$(-4.943, \infty)$: R

c.) abs Max: $(.259, 2.254)$ or 2.254 @ $x = .259$
local Max $(.259, 2.254)$
Min $(-1.526, -4.94)$ or -4.94 @ $x = -1.526$

d) Inc $(-1.53, .259)$
dec $(-2, -1.526) \cup (.259, 1)$

Check for symmetry with respect to both axes and the origin.

15. $xy^2 + 10 = 0$

omit

16. $f(x) = \frac{x}{x^2+1}$

omit

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Determine whether the function is even, odd, or neither.

17. $f(x) = x\sqrt{1-x^2}$ Odd

$f(-x) = -x\sqrt{1-(-x)^2}$ $f(-x) = -f(x)$

$= -x\sqrt{1-x^2}$

$f(x) \neq f(-x)$

$-f(x) = -x\sqrt{1-x^2}$

18. $g(x) = 4\sqrt[3]{x^2}$

$g(-x) = 4\sqrt[3]{(-x)^2}$

$= 4\sqrt[3]{x^2}$

$g(x) = g(-x)$

even

Find the domain in interval notation for each of the following. Verify your answer on your calculator!

19. $f(x) = \frac{2x}{x+11}$

$x \neq -11$

$(-\infty, -11) \cup (-11, \infty)$

20. $f(x) = \frac{\sqrt{x+1}}{x+1}$ $x \neq -1$ $x+1 \geq 0$

$x \geq -1$

$[-1, \infty)$

21. $f(x) = \frac{x+2}{x^2+11x+30}$ $(x+6)(x+5)$

$x \neq -6$ $x \neq -5$

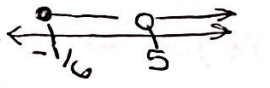
$(-\infty, -6) \cup (-6, -5) \cup (-5, \infty)$

22. $f(x) = \frac{\sqrt{6x+1}}{x-5}$ $x \neq 5$ $6x+1 \geq 0$

$6x \geq -1$

$x \geq -1/6$

$[-1/6, 5) \cup (5, \infty)$



Find the composition and then the domain for the compositions using the following functions. Verify your answer on your calculator!

$f(x) = x^2 + 1$ $g(x) = \sqrt{x}$ $h(x) = \frac{3}{x}$ $k(x) = 2x + 3$

23. $f(g(x))$ D $[0, \infty)$

$= (\sqrt{x})^2 + 1$

$= x + 1$

24. $h(g(x))$ D $(0, \infty)$

$= \frac{3}{\sqrt{x}}$

25. $(k \circ f)(x)$ $(-\infty, \infty)$: D

$= 2(x^2+1) + 3$

$= 2x^2 + 5$

26. $(h \circ k)(x)$

$= \frac{3}{2x+3}$ $(-\infty, -3/2) \cup (-3/2, \infty)$

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Find the domain in interval notation for each of the following functions.

16) $f(x)=\frac{2x}{x+11}$ $x\neq -11$

$(-\infty,-11)\cup(-11,\infty)$

17) $f(x)=\frac{\sqrt{x+1}}{x+1}$ $x\geq -1$ $x\neq -1$

$(-1,\infty)$

18) $f(x)=x^2-3x-54$

$(-\infty,\infty)$

19) $f(x)=\frac{x+2}{x^2+11x+30}$

$(x+6)(x+5)$

$(-\infty,-6)\cup(-6,-5)\cup(-5,\infty)$

20) $f(x)=\frac{\sqrt{6x+1}}{x-5}$ $x\neq 5$ $x\geq -1/6$

$[-1/6,5)\cup(5,\infty)$

21) $f(x)=\frac{\sqrt{x^2-1}}{x+3}$ $x\neq -3$

$(-\infty,-3)\cup(-3,1]\cup[1,\infty)$

Determine each of the following and state the domain.

$f(x)=x^2-4$ $g(x)=\sqrt{x}$ $h(x)=\frac{3}{x}$ $k(x)=2x+3$

22) $f(g(x))$

$=(\sqrt{x})^2-4$

$=x-4$ $x\geq 0$

$[0,\infty)$

23) $(g\circ f)(x)$

$=\sqrt{x^2-4}$

D: $(-\infty,-2]\cup[2,\infty)$

24) $(h\circ g)(x)$

$=\frac{3}{\sqrt{x}}$

D: $(0,\infty)$

25) $\left(\frac{k}{h}\right)(x)=\frac{2x^2+3x}{3}$

D: $(-\infty,0)\cup(0,\infty)$

26) $\left(\frac{g}{k}\right)(x)=\frac{\sqrt{x}}{2x+3}$

D: $[0,\infty)$

27) $f(k(x))=4x^2+12x+5$

D: $(-\infty,\infty)$

28) $(f-k)(x)=x^2-2x-7$

D: $(-\infty,\infty)$

29) $k(f(x))=2x^2-5$

D: $(-\infty,\infty)$

30) $g(h(x))=\frac{3}{\sqrt{x}}$

D: $(0,\infty)$

31) $f^{-1}(x)$

$y^{-1}=\pm\sqrt{x+4}$

D: $[-4,\infty)$

32) $(g\circ g)(x)$

$y^{-1}=\sqrt{\sqrt{x}}$

D: $[0,\infty)$

33) $k^{-1}(x)$

$y^{-1}=\frac{x-3}{2}$

D: $(-\infty,\infty)$

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For each of the following.

a) Determine if the function is one-to-one.

b) Find the inverse of the function of the function.

c) Then state the domain and range of the function and the inverse.

24) $f(x) = \frac{x+1}{x-5}$ ratio ⓒ $f(x)$ $D\ (-\infty,5)\cup(5,\infty)$ $R\ (-\infty,1)\cup(1,\infty)$

ⓐ yes

$x = \frac{y+1}{y-5}$

$xy - 5x = y + 1$

$xy - y = 1 + 5x$

$y(x-1) = 1+5x$

ⓑ $y^{-1} = \frac{1+5x}{x-1}$

ⓒ $f^{-1}(x)$ $D\ (-\infty,1)\cup(1,\infty)$ $R\ (-\infty,5)\cup(5,\infty)$

25) $g(x) = \sqrt[3]{\frac{x-2}{4}} - 5$ ⓒ $f^{-1}(x)$ $D\ (-\infty,\infty)$ $R\ (-\infty,\infty)$

a) yes

b.) $x = \sqrt[3]{\frac{y-2}{4}} - 5$

$4(x+5)^3 + 2 = y^{-1}$

26) $j(x) = \sqrt{x-2}$ $D\ [2,\infty)$ $R\ [0,\infty)$

a) yes

ⓒ $f^{-1}(x)$ ⓑ

$x^2 = y - 2$

$y^{-1} = x^2 + 2$

$D\ (-$

$R\ [2,\infty)$

ⓒ $f(x)$

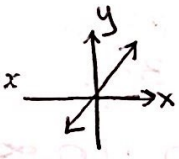
$f^{-1}(x)$

$D\ [0,\infty)$

$R\ [2,\infty$

Sketch each function and State the domain and range.

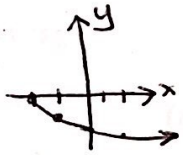
27) $f(x) = x$



$D: \mathbb{R}\ (-\infty,\infty)$

$R: \mathbb{R}\ (-\infty,\infty)$

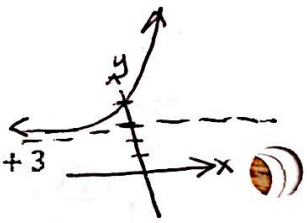
28) $g(x) = -\sqrt{x+2}$



$D: [-2,\infty)$

$R: (-\infty,0]$

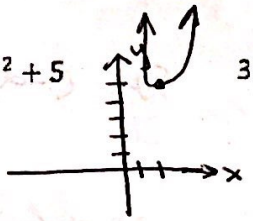
29) $f(x) = e^x + 3$



$D: (-\infty,\infty)$

$R: (3,\infty)$

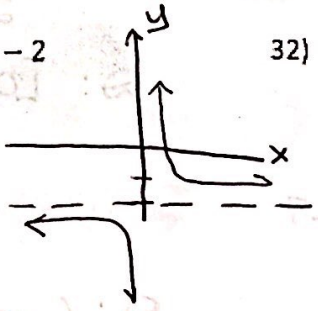
30) $h(x) = (x-2)^2 + 5$



$D: (-\infty,\infty)$

$R\ [5,\infty)$

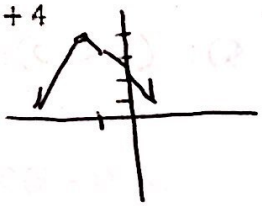
31) $m(x) = \frac{1}{x} - 2$



$D\ (-\infty,0)\cup(0,\infty)$

$R\ (-\infty,-2)\cup(-2,\infty)$

32) $y = -|x+1| + 4$



$D: (-\infty,\infty)$

$R\ (-\infty,4]$

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